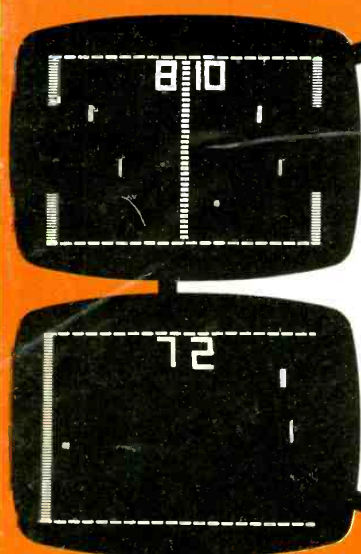


# electronics today international

MAY 1977

35p



## 4 IN 1 TV GAMES UNIT

FULL CONSTRUCTIONAL DETAILS OF THIS  
EASY-TO-BUILD PROJECT FEATURING:

- ◆ Full sound effects ◆ On screen scoring ◆ Variable angle
- ◆ Two bat sizes ◆ Ball speed control ◆ 'Rifle' motion
- ★ Special offer on IC.

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THAT WON THE WAR  
I<sup>2</sup>L EXPLAINED  
ELECTRONICS: 2000 A.D.**

## ETI PROJECT SO4

MAKE YOUR TELEVISION WORK FOR ITS WATTS WITH OUR

# TV GAMES UNIT

This low-cost yet sophisticated TV game contains just one main IC plus a handful of other components yet out-performs virtually all other units currently on the market.

SINCE THE ADVENT OF television games in this country, we have met with a steady tide of requests to produce a project for one ourselves. However, even with the higher integration allowed in CMOS chips, and no-one in their right minds would contemplate using TTL, it was still not viable for the home constructor. We were waiting for the single control chip to arrive on the open, as opposed to industrial, market.

At long last it has, in the form of the GI AY-3-8500, and so here is our version of a game utilising it. Figure 1 shows the kind of display produced by the chip, with its on-screen scoring facility and all. The games playable are:

1. PRACTISE: The ball reflects off the end and side walls, and the player has to stop it passing him. Every time it does, the machine scores a point.
2. SQUASH: A second bat is added to the display, and you play against each other. When it is your opponents turn, your bat will not affect the ball.
3. TENNIS: Television tennis is widely known and played, but see the specification section for the unusual features of our game.
4. FOOTBALL: The ball reflects off all four sides of the court, except the goal-mouth. This must be defended by the goalie to prevent the opposition scoring. In addition, each player has a forward on the screen, who acts as a normal bat when the ball is heading for his own goal, but allows the ball to pass through him, deflecting it in the process, when it is moving

towards the opposite goal.

### Rifling the screen

In addition, there are two rifle games included on the chip, but these need a special attachment to operate, which we are not including in this article, but will probably 'do up' later — especially if there is sufficient demand).

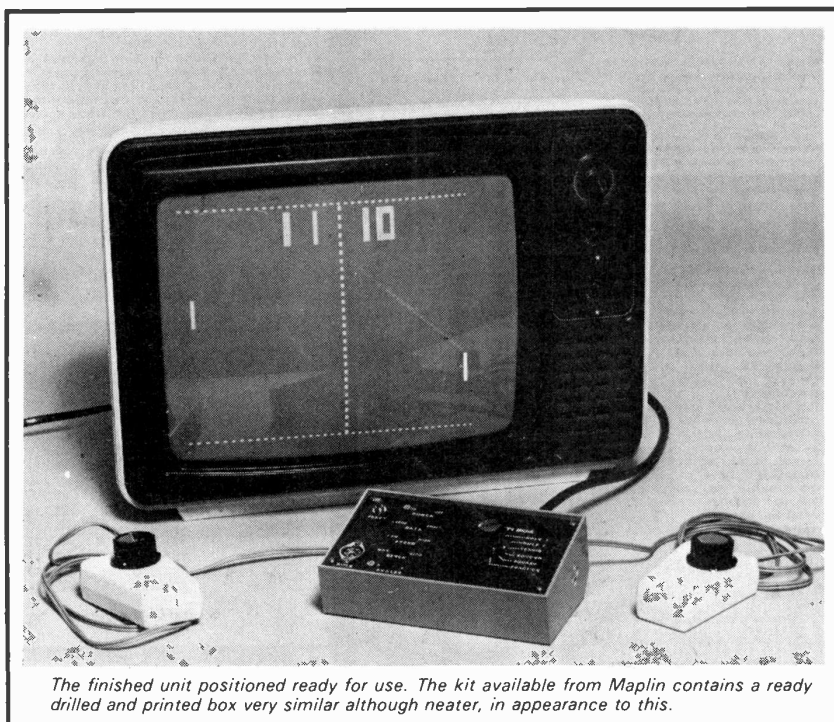
Some circuitry, additional to the main IC, in the form of two extra ICs, is required to build the basic game unit, but the complexity is still way way down on any other

method of obtaining 'the same display.

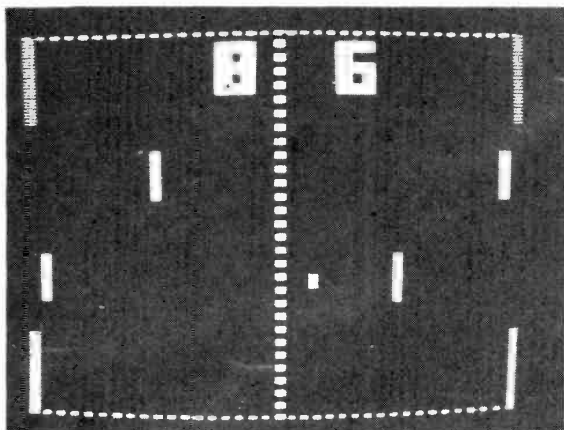
### Construction

Assemble the pcb, fitting the passive components and links first, along with the socket to the main chip. Leave this in its packing until you need it. Handle the CMOS chips carefully, and when fitting these, either use sockets or solder the power supply pins (7 and 14) first.

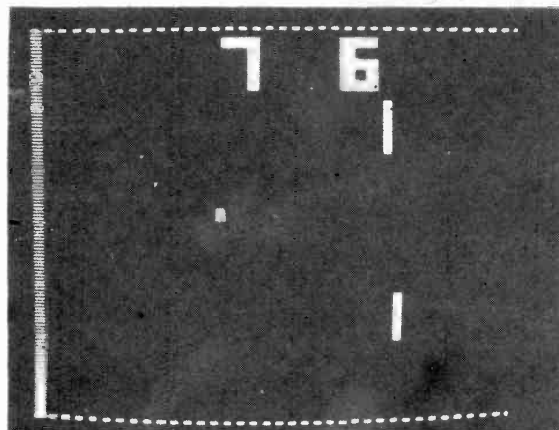
The switches will fit directly onto the board, and the rotary is



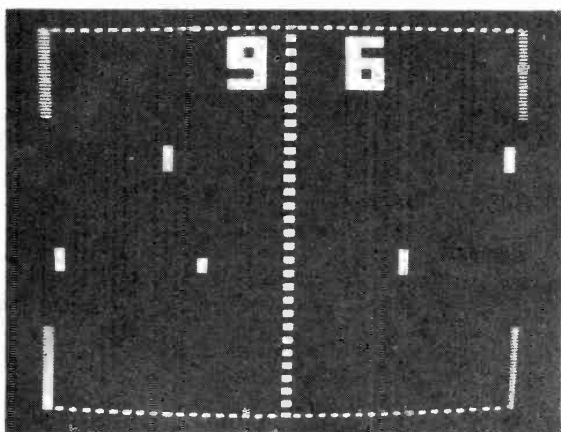
The finished unit positioned ready for use. The kit available from Maplin contains a ready drilled and printed box very similar although neater, in appearance to this.



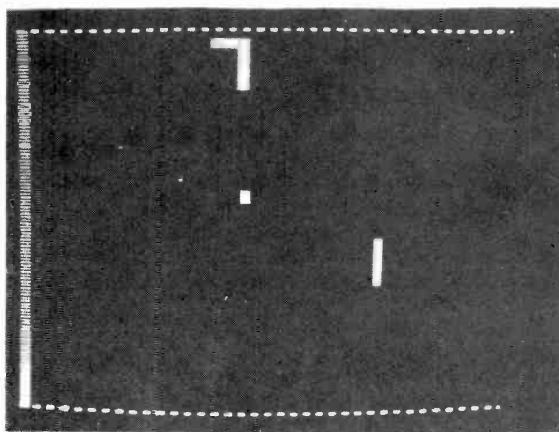
Soccer



Squash



Soccer with small bats



Practice

An illustration of some of the other displays produced by the unit. Note how much smaller the bats are on the soccer display — this facility is available on all the games.

## Specification

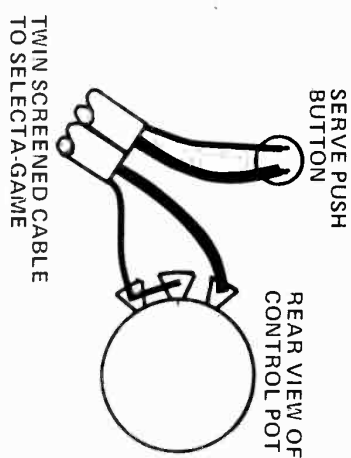
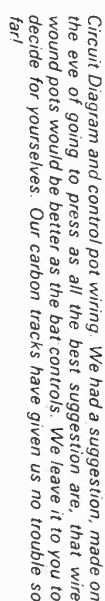
<b>Output</b>	Picture: TV signal (can be set up on any channel). Sound: Three audio tones indicate hit, bounce and score.
<b>Players' Controls</b>	Each player uses a single rotary control to position his bat/men on the screen. In the practice game one control operates; for tennis, soccer and squash two players each have a control. For the rifle games a special rifle is needed (not described in this article).
<b>Game Selection</b>	Basic Games: 1) Practice                      2) Squash 3) Soccer                        4) Tennis Other Games (these cannot be played without a special rifle): 5) Rifle—1                      6) Rifle—2
<b>Scoring</b>	On-screen scoring up to a maximum of 15 points.
<b>Other Features</b>	Two ball speeds Two bat sizes Two angles $\pm 20^\circ$ ; or four angles $\pm 20^\circ$ & $\pm 40^\circ$ . Manual or automatic service

used to hold the board to the front panel, so check your soldering carefully here. Fit the link to the modulator, and the wires out to the hand-held Vero boxes which contain the control and serve button for each player. Push these out through the (hopefully grommets) holes, tying a knot in each to make sure it doesn't strain the joint if pulled, and connect up the control boxes.

Once all the connections to the board are made, attach it to the front panel using the rotary switch, and two spacers on the switches for power and angle change.

If you use our kit from Maplin, the modulator is ready built, and there is no 'tuning up' to do. Simply bolt it in to the box through the hole provided, connect up power and video, and tune in a

# ETI PROJECT



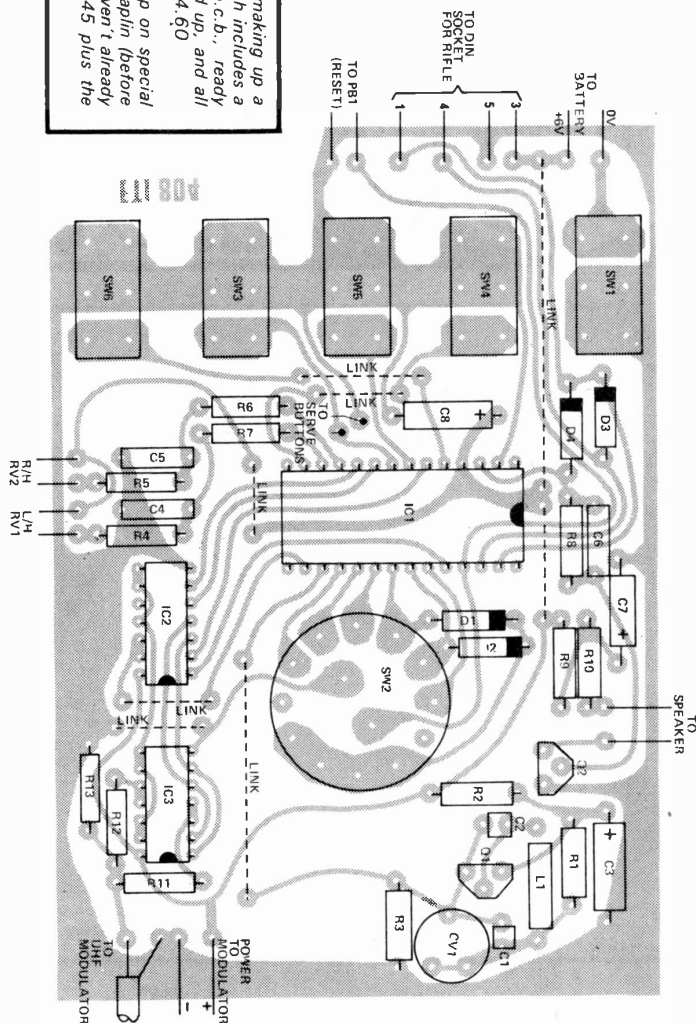


# TV GAME

Component Overlay for the T.V. game. Use UHF cable to connect up the modulator block to the board, and screened cable to wire up the hand-held boxes, connecting the screens and inners of the two "serve" wires to the pins in the center of the board.

Maplin Electronic Supplies are making up a kit of parts for this project which includes a ready assembled modulator, p.c.b., ready drilled box which is also printed up, and all components. All inc. price is £24.60

For those who obtained the chip on special offer at £8.99 all inc. from Maplin (before April 18th) so be quick if you haven't already got one! the kit price is £13.45 plus the voucher sent with the chip.



## How it works

Unfortunately the manufacturers don't give much information on how the main IC works — we are only told how to use it. The chip is obviously a digital IC (because there are two ball speeds, the rebound angles are defined and there is no provision for variable speed or bounce).

A 2 MHz oscillator is required for the chip to derive the synchronising pulses required for line and frame synchronisation of the TV set. This oscillator is provided by Q1 and its associated components with CV1 providing calibration.

The bats are simply one megohm potentiometers connected as variable resistors which effectively vary the charging time of capacitors C4 and C5. The capacitors C4 and C5 are discharged by the chip at each frame sync pulse and the time taken to charge again (as set by the bat pot setting) determines the vertical position of the bats on the screen. The bat size, ball speed, deflection angles and serve are simply selected by connecting the appropriate pin of the IC to '0' volts.

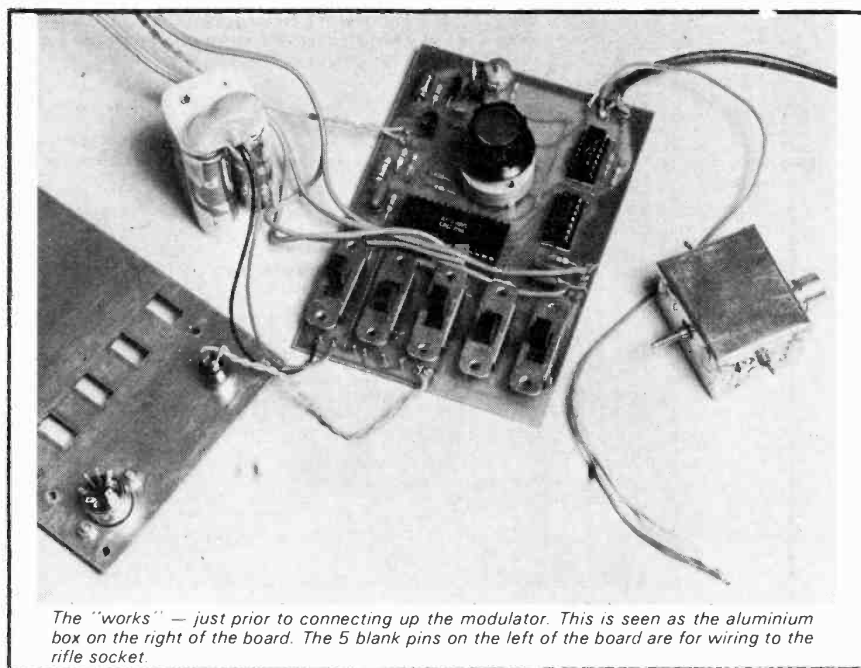
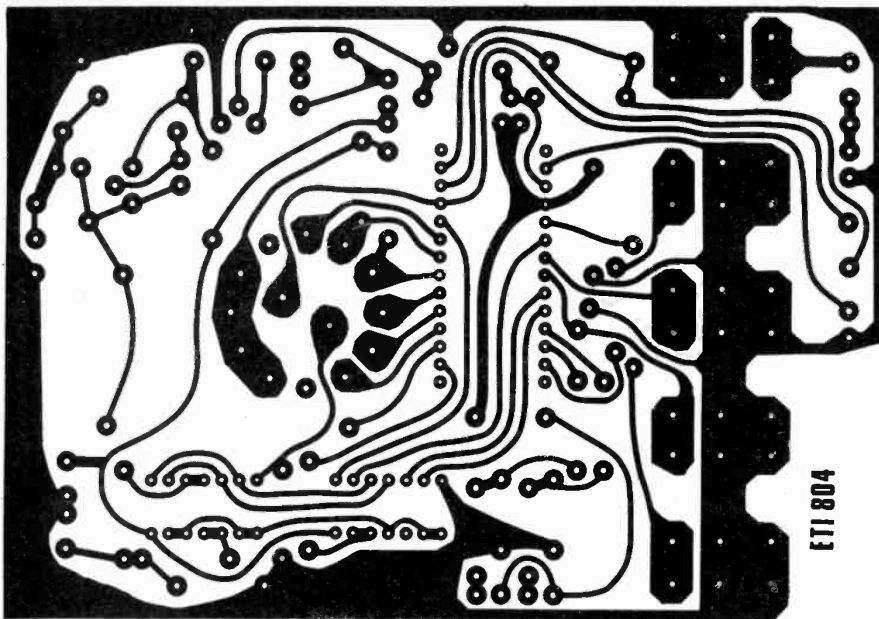
Outputs from the chip are left and

right bat, sync, ball, score and sound — all on separate pins. The bats, ball and score outputs are combined by IC2/1, 2 and IC3/1, 2 to produce a composite video signal. The sync pulse is buffered by IC2/3 and IC3/3, 4. The sync and information pulses are then added by R11, 12 and 13. The sound output is buffered by Q2 to provide the power necessary to drive the speaker.

So that the game may be fed into the antenna terminals of a TV receiver the video signal must be modulated onto an RF oscillator

## Parts List

<b>RESISTORS</b> all ½W 5%	
R1	10 k
R2	100
R3	1 k
R4,5	10 k
R6,7	270
R8	10 k
R9	100
R10	47
R11	4 k 7
R12	10 k
R13	1 k 5
<b>POTENTIOMETERS</b>	
RV1,2	1 M lin rotary
<b>CAPACITORS</b>	
C1,2	82 p ceramic
C3	33 µ 16 V
C4,5,6	1 µ polyester
C7,8	33 µ 16 V
<b>VARIABLE CAPACITOR</b>	
CV1	65 pF trimmer
<b>TRANSISTORS</b>	
Q1,2	BC148
<b>DIODES</b>	
D1 - D4	1N4148
<b>INTEGRATED CIRCUITS</b>	
IC1	AY-3-8500
IC2	4001 (CMOS)
IC3	4011 (CMOS)
<b>INDUCTORS</b>	
L1	100 µH
<b>MISCELLANEOUS</b>	
pcb ET1 804	
2 pole 6 position switch	
5 slide switches	
8 ohm speaker	
3.5 mm jack socket	
5 pin DIN socket type 'A'	
3 miniature push buttons	
3 knobs	
1 box	
2 small boxes	
Single 6 V battery holder	
28 pin IC socket	



The "works" — just prior to connecting up the modulator. This is seen as the aluminium box on the right of the board. The 5 blank pins on the left of the board are for wiring to the rifle socket.

spare button on your TV to give a picture. Adjust C2 until the picture locks.

Use UHF cable to link board and modulator and box and TV. Screened cable is all that is required to link control boxes and main unit.

### Play the game

With the angles switch at '2', the ball moves at  $\pm 20^\circ$  across the screen. When hitting the side boundaries the laws of reflection

are obeyed. When the ball hits the bat this isn't always the case: a ball hitting the top half of the bat will leave with an upward trajectory, and downwards from the bottom half.

With the angles switch at '4' the game becomes much more awkward! The bat is now divided into four sections. Starting from the top, the ball emerges at an angle of  $+40^\circ$ ,  $+20^\circ$ ,  $-20^\circ$ ,  $-40^\circ$ . If you think *that* is easy, try playing with small bats and high speed.

### NEW COMPONENTS SERVICE

**Resistors** 5% carbon E12 2.7 $\Omega$  to 10M  $\frac{1}{4}$ W 1p, 1W 2p. **Preset Pots** subminiature 0.1W E3 100 $\Omega$  to 4M7. Vertical 9p. Horizontal 9p. **Potentiometers** 0.25W E3 4K7 to 2M2 log or lin. Single 24p. Dual 75p. **Polystyrene capacitors** E12 63V 22pf to 8200pf 3 $\frac{1}{2}$ p. **Ceramic capacitors** vert. 50V E6 22pf to 47000pf 3p. **Mylar capacitors** 100V 001, 002, 005 4p, 01, 02, 025 4 $\frac{1}{2}$ p. **Polyester capacitors** 250V E6 01 to 1mf 5 $\frac{1}{2}$ p, 15, 22mf 7p, 47mf 11p. **Electrolytics** 50V 47, 1, 2mf 5p. 25V 5, 10mf 5p. 16V 22, 47mf 6p, 100mf 7p, 220mf 8p, 470mf 11p, 1000mf 18p. **Zener diodes** 400mW E24 3V3 to 33V 8 $\frac{1}{2}$ p.

### MAINS TRANSFORMERS

6.0-6V 100mA 94p. 9.0-9V 75mA 94p. 18V 1A E1 95. 0/12/15/20/24/30V 1A E3 65. 12.0-12V 50mA 94p. 0/12/15/20/24/30V 2A E4 95. 6.3V 1 $\frac{1}{2}$ A E2 10. 6.0-6V 1 $\frac{1}{2}$ A E2 55. 9.0-9V 1A E2 19. 12.0-12V 1A E2 49. 15.0-15V 1A E2 69. 30.0-30V 1A E3 39.

### PRINTED CIRCUIT KITS ETC ★

Contains etching dish, 100 sq ins of pc board, 1lb ferric chloride, etch resist pen, drill bit and laminate cutter E3 65. 100 sq ins pc board 75p. 1lb FeCl 95p. Etch resist pen 75p.

### S-DECS AND T-DECS ★

S-DeC E1 94. T-DeC E3 61.  
u-DeC E3 97. u-DeC E8 97.  
IC carriers with sockets.  
16 dil E1 91. 10TOS E1 79.



### SINCLAIR CALCULATORS, WATCHES AND POCKET TV ★

Sinclair pocket TV E165. Cambridge Scientific E8 95. Cambridge Memory E5 95. Oxford Scientific E13 30. Mains adapters (state model) E3 20. Assembled grey watch with free stainless steel bracelet E16 45. White watch E13 95.

### BATTERY ELIMINATOR BARGAINS

#### 3-WAY MODELS

With switched output and 4-way multi-jack connector. Type 1 3 / 4 $\frac{1}{2}$  / 6V at 100mA E2 30. Type 2 6 / 7 $\frac{1}{2}$  / 9V at 300mA E2 90.

#### 100mA RADIO MODELS

With press-stud connectors. 9V E3 45. 6V E3 45. 9V + 9V E5 45. 6V + 6V E5 45. 4 $\frac{1}{2}$ V + 4 $\frac{1}{2}$ V E5 45.

#### CASSETTE MAINS UNIT

7 $\frac{1}{2}$ V with 5 pin DIN plug. 150mA E3 65.

#### FULLY STABILIZED MODEL E5 45

Switched output of 3 / 6 / 7 $\frac{1}{2}$  / 9V 400mA stabilized.

#### CAR CONVERTORS E5 10

Input 12V DC. Output 6 / 7 $\frac{1}{2}$  / 9V DC 1Amp stabilized.

### BATTERY ELIMINATOR KITS

Send sae for free leaflet on range.

**100mA radio types** with press stud battery terminals. 4 $\frac{1}{2}$ V E2 10. 6V E2 10. 9V E2 10. 4 $\frac{1}{2}$ V + 4 $\frac{1}{2}$ V E2 50. 6V + 6V E2 50. 9V + 9V E2 50.

**Cassette type:** 7 $\frac{1}{2}$ V 100mA with DIN plug E2 10.

**Transistor stabilized 8-way type** for low hum. 3 / 4 $\frac{1}{2}$  / 6 / 7 $\frac{1}{2}$  / 9 / 12 / 15 / 18V 100mA E3 20. 1 Amp E6 50.

**Heavy duty 13-way types** 4 $\frac{1}{2}$  / 6 / 7 / 8 $\frac{1}{2}$  / 11 / 13 / 14 / 17 / 21 / 25 / 28 / 34 / 42V. 1 Amp model E4 95. 2 Amp model E7 95.

**Car converter kit:** Input 12V DC. Output 6 / 7 $\frac{1}{2}$  / 9V DC 1A transistor stabilized E1 95.

**Stabilized Laboratory power kit.** Switched 1 to 30V in 0.1V steps. 1 Amp E12 45. 2 Amp E14 95.

### SINCLAIR PROJECT 80 AUDIO MODULES

PZ5 E4 95. Z40 E5 75. Project 805Q E20 95.

#### BI-PAK AUDIO MODULES

S450 tuner E20 95. AL60 E4 60. PA100 E14 95. MK60 audio kit E3 1 95. Stereo 30 E1 95. SPM80 E3 65. BNT80 E3 32. Send sae for free data.

#### SAXON ENTERTAINMENTS MODULES

SA120B E16 95. SA1204 E11 95. SA608 E11 45. PM1201 / 8 E10 95. PM1202 / 8 E15 95.

### SINCLAIR IC20

IC20 10W + 10W stereo integrated circuit amplifier kit with printed circuit and data E4 95.

PZ20 Power supply kit for above E3 65.

VP20 Volume, tone-control and preamp kit E8 95. Send sae for free leaflet on the whole system.

### JC12 AND JC40 AMPLIFIERS

JC12 6W IC audio

amp with free data

and printed

circuit E1 95.

Also new JC40 20W

model with pcb

E3 95. Send sae for free leaflet on both models and associated power supply and pre-amp kits.



### FERRANTI ZN414

IC radio chip E1 44. Extra parts and pcb for radio E3 85. Case E1. Send sae for free data.

### SWANLEY ELECTRONICS

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Swanley, Kent

Mail order only. No callers. Send sae for free data on kits. Post 30p on orders under E4 50, otherwise free. Prices include VAT. Official orders welcome. Overseas customers please deduct 7% on items marked ★ and 11% on others.